

REMARKS

This response is being presented in response to the Office Action of June 21, 2004. The Examiner has indicated that all of the claims, that is claims 1-22 and 34-44, have been rejected. In light of the amendments and following detailed arguments, it is respectfully submitted that the claims fully distinguish over the applied prior art and are in condition for allowance.

The Examiner rejected claims 1-4, 8, 10-14, 18, 34, 38-40, 42 and 44 under 35 USC §103 as being unpatentable over Proscia (US 5,286,520) in view of Tracy et al (US 4,687,560) and Florczak (US 6,268,019). Claims 1, 2, 4-9, 17-22, 34-37 and 40-44 were rejected under 35 USC §103 as being unpatentable over Gallego et al (US 6,048,621) in view of Tracy et al and Florczak. Claims 1, 2, 5-8, 10-16, 18, 23, 34-35, 38-42 and 44 were rejected under 35 USC §103 as being unpatentable over Riaz et al (US 5,385,751) in view of Tracy et al and Florczak. Claims 1, 2, 8, 10-14, 17, 19, 34, 38-40 and 42 are rejected under 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa.

The present invention provides a chemical vapor deposition process for the production of a tungsten oxide coating which uses particular tungsten precursors and which is carried out in a temperature range (500°-720°) than was previously contemplated. This allows coatings to be deposited within a range of stoichiometries. The higher temperatures of the range offer advantages in the on-line production of coated glass, as there is an improved opportunity to deposit an additional coating or coatings on-line. The independent claims of the present invention were previously amended to clarify that the deposition processes occur in an on-line process, and have now been amended to indicate that the oxidant comprises an ester. This subject matter was present in, at least, originally presented claim 5.

Independent claim 1 was rejected: under 35 USC §103 as being unpatentable over Proscia in view of Tracy and Florczak; under 35 USC §103 as being unpatentable over Gallego in view of Tracy and Florczak; and under 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa.

Independent claim 1 is directed to a chemical vapor deposition process for depositing a coating comprising tungsten oxide on-line on the surface of a glass substrate to produce a solar control glass which transmits a high percentage of incident light. The process directs a gaseous stream comprising tungsten oxyhalide or tungsten chloride and a source of oxygen on to the surface of the glass substrate. The glass substrate is at a temperature in the range 500°C to 720°C.

Independent claim 20 was rejected under 35 USC §103 as being unpatentable over Gallego in view of Tracy and Florczak. Claim 20 is directed to a chemical vapor deposition process for coating glass. The process comprises directing a gaseous stream containing a tungsten compound and a source of oxygen on to the surface of a glass substrate thereby forming a non-stoichiometric tungsten oxide layer. The tungsten oxide layer is overcoated with a further layer.

Independent claim 38 was rejected under: 35 USC §103 as being unpatentable over Proscia in view of Tracy and Florczak; 35 USC §103 as being unpatentable over Riaz in view of Tracy and Florczak; and 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa. Independent claim 38 defines a chemical vapor deposition process for coating glass. The process includes entraining a tungsten compound in a gas by flowing the gas over a tungsten compound at a temperature below its melting point. The gaseous stream is directed onto the surface of a glass substrate thereby forming a tungsten oxide layer. The glass substrate is at a temperature in the range of 500°C to 720°C.

Independent claim 40 was rejected: under 35 USC §103 as being unpatentable over Proscia in view of Tracy and Florczak; under 35 USC §103 as being unpatentable over Gallego in view of Tracy and Florczak; under 35 USC §103 as being unpatentable over Riaz in view of Tracy and Florczak; and under 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa.

Independent claim 40 defines a method of coating glass, which comprises providing a glass substrate in a chemical vapor deposition process having a temperature in the range of 500°C to 720°C. Then, preparing a gaseous stream comprising a source of oxygen and a

tungsten compound selected from the group consisting essentially of tungsten oxyhalide and tungsten chloride. And finally, directing the gaseous stream on to the glass substrate, thereby depositing a coating comprising tungsten oxide on the glass substrate

Independent claim 41 was rejected: under 35 USC §103 as being unpatentable over Gallego in view of Tracy and Florczak; and under 35 USC §103 as being unpatentable over Riaz in view of Tracy and Florczak.

Claim 41 defines a chemical vapor deposition process for depositing a coating comprising tungsten oxide on the surface of a glass substrate. A gaseous stream comprising tungsten oxyhalide or tungsten chloride and an ester are directed on to the surface of the glass substrate.

The independent claims have been amended to further clarify that the process occurs on-line, i.e. that the coating is applied to the glass substrate in an on-line process.

*Rejection of claims 1-4, 8, 10-14, 18, 23, 34, 38-40, 42 and 44 under 35 USC §103 as being unpatentable over Proscia (US 5,286,520) in view of Tracy et al (US 4,687,560) and Florczak (US 6,268,019).*

Each of the rejected independent claims has been amended to indicate that the oxidant comprises an ester, which subject matter was pending in originally presented claim 5 which was not rejected over this combination of reference. Therefore, it is respectfully submitted that each of the independent claims distinguishes over this reference.

In view of the above, it is respectfully submitted that the rejections of claims 1-4, 8, 10-14, 18, 23, 34, 38-40, 42 and 44 under 35 USC §103 as being unpatentable over Proscia (US 5,286,520) in view of Tracy et al (US 4,687,560) and Florczak (US 6,268,019) should be withdrawn.

*Rejection of claims 1, 2, 4-9, 17-22, 34-37 and 40-44 under 35 USC §103 as being unpatentable over Gallego et al (US 6,048,621) in view of Tracy et al and Florczak.*

The Examiner acknowledges that Gallego does not teach the use of Tungsten oxyhalides or tungsten chlorides as required by the claims of the present invention. As with the preceding rejection, the Examiner relies on the disclosures of Tracy and Florczak to overcome these deficiencies.

The Examiner's attention is directed towards attachment A, which is a declaration from inventor Kevin Sanderson, who is an expert in the field. In paragraph 9 of the declaration, Mr. Sanderson notes that precursor choice is significant in on-line coating processes because of the volatility and stability of the precursors of the metal oxide. Thermal decomposition and pre-reaction must both be avoided in on-line processes. A significant discovery reflected in this invention, as noted in paragraph 10, is that the use of precursors tungsten oxy halide or tungsten chloride, both of which are delivered as sublimed metals, volatilize to form a sufficient vapor stream, and when mixed with an oxidant which contains an ester, they do not pre react.

The Gallego reference is discussed in paragraphs 17 and 18 of the declaration, and refers back to paragraph 11 relating to the Proscia reference. The Gallego reference, as discussed in paragraph 17 of the declaration, utilizes a plasma assisted CVD process. In paragraphs 12 and 13 of the declaration, Mr. Sanderson attests that plasma assisted CVD requires that the reactants are vaporized at low temperatures and pressures. No reaction occurs until power is applied to generate a plasma. As attested, there is no possibility of a pre reaction in a plasma assisted CVD process, and so this significant concern of the present invention is a non-factor in the Gallego reference. Further, deposition rates, which are determinative of the usefulness of an on-line CVD process, are insignificant in plasma assisted CVD, as the power can continue to be applied until a coating of the desired thickness is achieved. Thus, as attested to by Mr. Sanderson, one skilled in the art of on-line CVD processes would not look to plasma assisted CVD processes for precursors, as both the reaction conditions, and process concerns (pre reaction and deposition rate) are significantly different.

Mr. Sanderson also discussed the Florczak reference in paragraphs 14, 15 and 16 of his declaration. Particularly in paragraph 15 it is noted that separate streams of reaction gas and carrier gas with titanium tetrachloride vapor must be employed to prevent pre reaction. This is contrary to the teaching of the present invention, wherein the gaseous precursor stream contains both the tungsten precursor and the oxidant. The separate streams required by Florczak are not particularly suitable for use in an on-line process. Thus Florczak is not suitable to be combined as is done by the Examiner. Even if it were to be used in conjunction with the Gallego and Tracy

references, the present invention would show a significant improvement over the art in that the precursors could be combined, simplifying the invention.

The Tracy reference is discussed in paragraphs 12, 13 and 16 of the declaration. As with Gallego, Tracy uses a plasma assisted CVD process. For the same reasons as shown with Gallego, a plasma assisted CVD process is not suitable for use with the present invention. Nor is it suitable to be used in combination with a reference showing an atmospheric pressure CVD process.

As stated previously, the use of Tracy and Florczak together suffers from additional deficiencies. The Tracy reference is not applicable to the present invention because it teaches a different process, not one that a person skilled in the art would look to when designing a CVD process. With regard to Florczak, while this reference teaches a CVD method, nothing in this reference is relevant to the *deposition of tungsten oxide*. Florczak primarily addresses the deposition of titania using the reactor described in Figure 1 of the reference. Only in the abstract, and at column 6, line 55, does Florczak suggest the use of the process with any other metals. Even here, the only other suggested metals are tin germanium and vanadium. There is *nothing to suggest to one skilled in the art that the processes of Florczak would be compatible with metals outside this group, and certainly not to tungsten*. As there is no suggestion in Tracy to use a chemical vapor deposition process, and no suggestion in Florczak that the process described therein would be compatible with any metals not listed, i.e. tungsten, there is nothing in either reference to lead one skilled in the art to combine those references. Therefore, it is respectfully submitted that the combination of these references is improper.

Therefore, it is asserted that the rejection of claims 1, 2, 4-9, 17-22, 34-37 and 40-44 under 35 USC §103 as being unpatentable over Gallego et al (US 6,048,621) in view of Tracy et al and Florczak is improper, and should be withdrawn.

*Rejection of claims 1, 2, 5-8, 10-16, 18, 23, 34-35, 38-42 and 44 under 35 USC §103 as being unpatentable over Riaz et al (US 5,385,751) in view of Tracy et al and Florczak.*

The Riaz reference is discussed at length in the inventor's declaration in paragraphs 19-23. Mr. Sanderson points out that Riaz discloses a CVD process for the deposition of a fluorine doped tungsten oxide coating on the surface of a glass substrate. Mr. Sanderson notes that the Riaz reference requires separate reaction streams to avoid a propensity to pre react. In paragraph 22, Mr. Sanderson explains in additional detail why the applied references are not applicable to on-line processes.

As stated previously, with regard to the Riaz reference, the Examiner acknowledged that Riaz does not explicitly teach the use of applicant's tungsten precursor. Applicants assert that Riaz specifically teaches the use of a tungsten alkoxide precursor in a CVD process. Riaz does not explicitly or implicitly, suggest any other tungsten containing precursor. Thus, it is respectfully submitted that the disclosure of Riaz is no broader than the disclosure of the Gallego reference. Therefore, the same assertions made with regard to Gallego are also applicable against the rejection based on Riaz.

As before, applicant respectfully asserts that Tracy does not disclose a chemical vapor deposition process, as is claimed in the amended independent claims, but instead teaches a plasma deposition process, which is significantly different, and would be so recognized by one skilled in the art. Tracy, as demonstrated above, thus teaches that the reactants tungsten chloride and tungsten oxytetrachloride are useful in deposition processes carried out under vacuum, at low temperature and which use electrical energy to drive plasma formation. These processes are different from, and in fact are irrelevant to the chemical vapor deposition processes of the present invention, which are carried out at atmospheric pressure and high temperature, and which use heat to drive the reaction and not electrical energy. Thus, one skilled in the art would not look to the Tracy reference as being relevant to the present invention. Therefore, the use of the Tracy reference against the present invention is improper.

Also, the use of Tracy and Florczak together suffers from the same deficiencies asserted above. The Tracy reference is not applicable to the present invention because it teaches a different process, not one that a person skilled in the art would look to when designing a CVD process. With regard to Florczak, while this reference teaches a CVD method, nothing in this

reference is relevant to the *deposition of tungsten oxide*. Florczak primarily addresses the deposition of titania using the reactor described in Figure 1 of the reference. Only in the abstract, and at column 6, line 55, does Florczak suggest the use of the process with any other metals. Even here, the only other suggested metals are tin germanium and vanadium. There is *nothing to suggest to one skilled in the art that the processes of Florczak would be compatible with metals outside this group, and certainly not to tungsten*. As there is no suggestion in Tracy to use a chemical vapor deposition process, and no suggestion in Florczak that the process described therein would be compatible with any metals not listed, i.e. tungsten, there is nothing in either reference to lead one skilled in the art to combine those references. Therefore, it is respectfully submitted that the combination of these references is improper.

In view of the above, the Rejection of claims 1, 2, 5-8, 10-16, 18, 23, 34-35, 38-42 and 44 under 35 USC §103 as being unpatentable over Riaz et al (US 5,385,751) in view of Tracy et al and Florczak is submitted to be improper, and it is respectfully requested that this rejection be withdrawn.

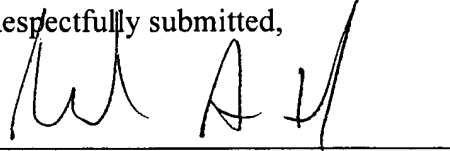
*Rejection of claims 1, 2, 8, 10-14, 17, 19, 34, 38-40 and 42 under 35 USC §103 as being unpatentable over Florczak in view of Proscia or vice versa.*

As noted above with regards to the earlier rejection over the Proscia reference, the Examiner did not apply this rejection against claim 5, which included the subject matter that the oxidant comprises an ester. Independent claims 1, 20, 38 and 40 have been amended herein to include the subject matter that the oxidant comprises an ester. It is therefore submitted that each of these independent claims now distinguishes over the applied references at least on this basis.

Therefore, on the basis of the forgoing, it is respectfully submitted that independent claims 1, 20, 38, 40 and 41 fully distinguish over the applied references. Any dependent claims not specifically discussed hereinabove are believed to be allowable based, at least, upon their dependence on allowable base claims as discussed above.

In view of the above remarks, a favorable reconsideration of the present application and the passing of this application to issue with all claims allowed are courteously solicited. If the Examiner wishes to modify any of the language of the claims in an effort to move the application towards allowance, a telephone call to the undersigned would be greatly appreciated.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Mark A. Hixon', is written over a horizontal line.

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